UNIVERSITY OF CALIFORNIA.

AGRICULTURAL EXPERIMENT STATION.

BERKELEY, CAL.

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BULLETIN NO. 101

FURTHER EXAMINATION OF CALIFORNIA PRUNES, APRICOTS, PLUMS AND NECTARINES.

NOTE.—For the purposes of this discussion a distinction is made between plums and prunes, as is common in the horticultural literature of this State. By the term "prune" is singified a plum which dries successfully, without removal of the pit, and produces a sweet dried fruit, though in the confusion of our nomenclature, not even this broad classification is faithfully followed. For example, we have the "Hungarian prune" as a local traditional name for Pond's Seedling plum, which has no value as a prune; and we have also Coe's Golden Drop plum which does answer the requirements for a dried prune, and in that form is marketed as a prune, and sometimes given fancy names by packers. We do not, however, in this publication, attempt to correct the classification, but follow the popular arrangement.

The order of enumeration of fruits in the head line above, and in the tabular statements which follow, is based upon the relative commercial importance of the fruits in this State. An arrangement of the chief table of analyses is also made to bring into juxtaposition the varieties from adjacent regions of the State that effects of local climates and soils upon the same variety may be disclosed if such exist. As this is only the beginning of such investigation, the results in this regard should be looked upon as tentative. Many more analyses are required to demonstrate constant differences of this nature, and we invite the sending of representative samples of named varieties from all parts of the State. It is well to send about ten pounds of each variety, each specimen being wrapped to prevent bruising. Such samples may be sent by express at our expense. Each shipment should be accompanied by a letter giving name of varfety, age of tree and stock upon which it is budded or grafted, location of orchard, and name of grower; also notes of culture, irrigation, etc. Address such shipments to "Agricultural Experiment Station, University of California, Berkeley, Calif."

This bulletin is a continuation of the work reported in Bulletin 97 of this Station, and in some paragraphs the text is reproduced, only changing figures to include the results of a greater number of analyses. It is perhaps only fair to Mr. Colby to state that the analyses of the fruit grown in 1892 are his personal work, and have been made without assistance.

E. J. WICKSON.

The subjects discussed in this paper are summarily set forth in the following quotation from Bulletin 93 of this department:

"The purpose of this work is to show comprehensively the proximate and ash composition of

*Absent on leave, 12 mos., from June 15, 1892.

the leading varieties of fruit as grown in the principal fruit regions; and inferentially, the influence exercised upon them by the prominent conditions of soil, climate, fertilizers, etc. The physical data (proportion of pits to flesh, etc.,) are of interest from a commercial standpoint, as showing what is being purchased as to available and waste material, etc.

"The consumer, though usually considering fruit as a luxury, would derive much valuable knowledge from studying the fruits in their relative values as foods. The nourishing portions, shown especially by the nitrogenous and saccharine contents, vary greatly with the variety and conditions of growth. It is not, then, a matter of indifference to the consumer what fruit he uses, but an important question of domestic economy.

"The ash ingredients, together with the nitrogen contents of the standard varieties, are of high interest in connection with vital question of soil exhaustion and fertilization. The soil ingredients extracted by an ordinary crop are a serious drain upon the supporting soil, and the lines of heaviest draft can only become known by the actual determination of the constitutents withdrawn."

Description of Prunes, Apricots and Plums Received in 1892.

(For a description of these fruits received and analyzed in 1891 see bulletin No. 97, of this station.)

PRUNES.

No. 31, French, Auburn, Placer Co.—Young Bros., growers; sample received Oct. 7, 1892; condition good; size, large; taste, very sweet; flesh firm and juicy. "The soil is red slate, well drained with southern exposure; very little irrigation used."

No. 32, French, Newcastle, Placer Co.—E. B. Silva, grower; sample received Sept. 23, 1892; condition somewhat poor—fruit a little shriveled and very ripe; size, small; flesh rather juicy and very sweet.

No. 33, French, Yuba City, Sutter Co.—R. C. Kells, grower; sample received Sept. 27, 1892; condition fair, but very ripe. "The soil is a sandy loam with a dark clay subsoil—top soil being of a dark gray or light brown color; ranch lays about three-quarters of a mile from west bank of the Feather river, drainage good. Trees eight years old on peach root."

Nos. 34, 35 and 36, French, Campbell, Santa Clara Co.—Campbell Fruit-Growers' Union, growers. Samples Nos. 34 and 35 received Sept. 1, '92; No. 36, Sept. 21, '92. No. 34 (unirrigated). Condition only fair, fruit being slightly shriveled; flesh not as firm as that of No. 35; size large, taste very sweet. No. 35 (winter irrigated). Condition good, fruit full, well-rounded and firm-fleshed; oversized, flesh tender and more juicy than that of No. 34. No. 36 (irrigated in June). Condition fair, fruit slightly shriveled and very ripe, not as large as either No. 34 or 35; flesh, like that of No. 34, rather coarse-textured and not as juicy or tender as that of No. 35.

F. M. Righter, vice president of the Campbell Fruit Growers' Union, writes: "There is a great variety of soil in this valley; it is generally a gravelly loam—a sediment deposited by the Los Gatos creek—and upon this the prunes were grown. This soil is very porous, trees cannot be injured by water during winter—have had several feet of water around some of my trees as late as June without injuring them. The soil varies in depth from 10 to 18 feet, in some places the soil to the depth of four or five feet is very sandy, below that there is more clay."

Nos. 40 and 41 French, Ventura, Ventura Co.—J. W. Anderson, grower; samples received Sept. 5, 1892. No. 40 "large" is usual in size; flesh, firm, rather juicy and sweet tasted. No. 41 "small," undersized, large-pitted fruit. "These prunes are from a mountain-valley orchard 2½ miles from sea, elevation 700 feet, with mountains 2000 feet high between the valley and ocean. The larger (No. 40) was raised on sandy soil; the smaller (No. 41) ones on heavier soil."

No. 42, French, Pomona, Los Angeles Co.—P. M. Doyle, grower, sample received Sept. 6, 1892. Condition, good; size, usual; fruit, hard and juicy, but not very sweet. Mr. John S. Calkins, who procured this sample for the Station, writes: "These prunes are from an orchard 7 years old, growing on sandy loam soil, 1½ miles northeast of Pomona, on the Kingsley tract. Trees bore good crop last year, also being very full this year."

No. 44, French, Chino, San Bernardino Co.—J. W. Lawson, grower; samples received Sept. 20, 1892. Conditions, good; flesh, tender and juicy. "Soil, sandy loam; elevation, 300–400 feet; orchard situated 2

miles due north of Chino Exp't. Station. Trees, 5 years old; irrigation resorted to once each month during dry season. Ground has been fertilized but once and then stable-manure only was used."

No. 37, Robe de Sergent, San Jose, Santa Clara Co.—John Rock, grower; sample received Aug. 25, 1892. Condition, good; fully ripe and more juicy than that of No. 5; flesh, tender and sweeter than the previous year's sample.

No. 38, Fellenberg, San Jose, Santa Clara Co.—John Rock, grower; sample received Aug. 25, 1892. Condition, good; fully ripe; flesh, hard and juicy, only moderately sweet.

No. 39, Bulgarian, San Jose, Santa Clara Co.—John Rock, grower; sample received Sept. 30, 1892. Condition, rather poor, over-ripe and shriveled; examined for the sake of comparing sugar contents with that of No. 8, the same variety of crop of 1891.

Of these samples Nos. 37, 38, 39, Mr. Rock says: "Last season (1891) they were all overbearing and lacked flavor, this year (1892) the crop is light and the fruit better. The land on which the prunes were grown is a sandy alluvial soil, made by deposits from Coyote Creek. These deposits are from four to six feet deep, under which lays a statum of three to four feet of loam, under this a sandy layer lighter than the surface soil. During the summer the ground water is from fourteen to eighteen feet below the surface."

PLUMS.

No. 45, Coe's Golden Drop, Auburn, Placer Co.—Young Bros., growers; sample received Oct. 7, 1892; condition good—sample somewhat larger than that from Marysville (No. 46); flesh firm and not as juicy as the French prunes.

No. 46, Coe's Golden Drop, Marysville, Yuba Co.—Dr. S. Jewett, grower; sample received Aug. 30, 1892; condition excellent; flesh firm and juicy.

No. 47, Yellow Egg, Marysville, Yuba Co.—Dr. S. Jewett, grower; sample received Aug. 30, 1892; condition very good; flesh firm and more juicy than that of the other plums. Both No. 46 and 47 were from trees six years old grown on heavy sandy loam soil with clay sub-soil.

APRICOTS.

No. 25, Royal, Concord, Contra Costa Co.—J. T. Sutton, grower; sample received Aug. 1, 1892; condition good; sample fully ripe and very large, from young trees three years old.

No. 26, Royal Oleander, Fresno Co.—J. H. Harding, grower; sample received June 24, 1892; condition excellent; undersized; flesh quite juicy, but not very sweet; flavor peachy. "This year my trees are so heavily loaded that the fruit is very small, the trees have not had any irrigation for two years; age of trees nine years, have made only medium growth and have borne very heavily for five years. Soil sandy, slightly tending to white ash, sub-water level ten feet below surface."

No. 27, Royal, Santa Maria, San Luis Obispo Co. — L. E. Blochman, grower; sample received Aug. 10, 1892; condition good, quite ripe, color high; usual size; flesh firm and rather juicy.

No. 28, Royal, North Pomona, Los Angeles Co.—Mrs. J. L. Loomis, grower; sample received July 2, 1892; condition excellent; fruit fully ripe and quite large; flesh tender and very juicy. Mr. J. S. Calkins, who obtained the samples for the Station, writes: "Trees seven years old, in gravelly loam soil, irrigated once this year. The location is about three miles sotuh of the foothills of the Sierra Madre mountains."

No. 29, Hemskirk, Oleander, Fresno Co. —A. Allision, grower; sample received June 25, 1892; condition good; flesh firm and juicy. "Trees nine years old, heavy regular bearers, soil white ash, water level seven and a half feet below surface."

No. 30, Moorpark, Oleander, Fresno Co.—J. H. Harding, grower; sample received, June 25, 1892; condition very good; color light. "Soil sandy; trees nine years old and unirrigated; water level, ten feet."

NECTARINE.

No. 48, "The New White," Yuba City, Sutter Co.—H. P. Stabler, grower; sample received, Sept. 1, 1892; condition excellent;

a very large-sized light-colored fruit, very juicy and pleasantly tart to taste; flesh very delicate.

Discussion of Results of Analyses.

The table given below shows the results of the analytical work for the seasons 1891 and 1892, that of 1892 covering a greater area of the State than that of 1891, which dealt mostly with Santa Clara valley fruits. Subdivision A gives the physical and genera proximate analyses, and under this head we have added to that of the previous season the separation of the pit into its component parts—shells and kernels—and reported upon the nitrogen contents of these separate parts. Subdivision B gives the results of the complete analysis of the ash, in which we have considerably extended the work, as compared with that of 1891, to northern and southern California fruits.

In the following discussion of the chief points illustrated by the tables, we shall use such parts of Bulletin 97 as answer for comparison, etc., without further reference to it.

Proportions of Pits to Flesh.

Prunes.—The range in the percentages of pits is from 3.7, in Hungarian, No. 7, to 7.5 in Robe de Sergent, No. 5; 5.8 per cent representing the general averages for both the French (No. 49) and all prunes (No. 50). (No. 39, Bulgarian, with 9.2 per cent pits, by reason of its over-ripeness, is not included in the above statement.) The later work then verifies our previous conclusion that these fruits contain about 17 times as much flesh as pits.

Plums.—In these the range in the percentages of pits, somewhat less than that for prunes, is from 3.4 per cent in Coe's Golden Drop, No. 45, to 6.1 per cent in Yellow Egg, No. 47, the average being 4.8 per cent, leaving nearly 20 times as much flesh as pits.

The consumer thus finds that the plums possess a small advantage over the prunes, and the prunes, on the whole, amongst themselves, no appreciable advantage in regard to the proportion of pits to flesh.

Apricots.—For the fully-ripe and largely-grown varieties from all localities the variation of pit percentages is from 5.3 (Moorpark, No. 30) to 7.1 (Royal, No. 26), a smaller difference than is found in the prunes or plums, viz., 3.8 per cent for prunes and 2.7 for plums as against 1.8 for apricots. The average pit contents is 6.2 per cent; the flesh, then, is 15 times more in amount than pits. Here, again, there is but a trifling advantage in choice of varieties, so far as the proportion between flesh and pit is concerned.

For equal weights of prunes and apricots, whole fresh fruit, the consumer receives nearly the same amount of flesh or available matter; but the apricots being about 2.7 times larger than the prunes, we have, on the average, 7.5 apricots as against 20.3 prunes per pound avoirdupois. This same difference seems to exist between the plums and prunes.

"European analyses of these fruits report figures which do not differ materially from those furnished in the above table; the average pit percentages for prunes is 5.4, for apricots 5.3, the weights for whole fruits not being given in the analyses at hand."

The proportion, on the average, of *shells* to *kernels* in the *pits* of the prunes and apricots examined seems to be very constant and nearly the same for both fruits, or about as 3 to 1. The *kernels* of all these fruits were full and well developed; the largest pits, however, do not show, for either of these fruits, correspondingly heavy kernels.

Proportion of Juice to Flesh.

Prunes and Plums.—The French prune on the average shows the largest proportion of free juice, 4.3 per cent more than the average for all the prunes, namely, 83 per cent, or about *four-fifths* of the flesh. No. 7, Hungarian, while the largest of the prunes has 13 per cent less juice than the average French prune, i. e., 70 as against 83 per cent. The *plums*, although not as large as the Hungarian prune, are, on an average, about 5 per cent higher in juice, a figure which nearly expresses the difference between the French prunes and the plums. *Three-fourths* of the flesh of the plum, average, is juice, thus showing the prune-flesh one-twentieth more juicy than than that of of the plum.

Apricots.—The proportion of juice to flesh is nearly the same for all the samples,

ANALYSES OF CALIFORNIA PRUNES, APRICOTS AND PLUMS, CROPS OF 1891 AND 1892.

A.—PROXIMATE ANALYSES.

Number	Variety	Place of Production	Sender or Grower	Date of Receipt and Analysis	Physical Analysis: Average Weight in Grams†	Number per pound	Flesh, per cent.	Pits, per cent.	Pits: Shells, per ct. in Fresh Fruit	Pits: Kernels, per ct. in Fresh Fruit	Flesh: Juice, Pressed, per cent.	Flesh: Pulp, Pressed, per cent.	Juice: Total Sugar by Copper (Inversion), per cent.	Juice: Acid, in terms of Sulphuric (SO_3) per ct.	Sugar: In Fresh Flesh per cent.	Sugar: In Fresh Fruit per cent.	Nitrogen: In Whole Fresh Fruit, per cent.	Nitrogen: In Fresh Flesh per cent.	Nitrogen: In Fresh Pits, per cent.: Total	Nitrogen: In Fresh Pits, per cent.: Shells	Nitrogen: In Fresh Pits, per cent.: Kernels	Albuminoids in Whole Fresh Fruit, Nitrogen x 6.25	Ash (Pure): In Whole Fresh Fruit, per cent.	Ash (Pure): In Fresh Flesh per cent.	Ash (Pure): In Fresh Pits, per cent.	General Proximate Analysis: Water, per cent.	Organic Matter, per cent.	Ash, per cent.	Total	Number
	PRUNES.																													
	Northern California.																													
31	French	Auburn, Placer Co.	Young Bros.	Oct. 7, 1892	25.0	18.0	94.8	5.2	4.2	1.0	85.2	14.8	25.25	.38	21.51	20.39	.174	.142	.715	.043	.872	1.088	.737	.730	.634	67.80	31.463	.737	100.00	31
32	French	Newcastle, Placer Co.	E. B. Silva	Sept. 23, 189.	16.2	28.0	92.6	7.4	5.6	1.8	83.4	16.6	26.45	.37	22.04	20.41	.172	.126	.765	.001	.764	1.075	.744	.738	.700	67.30	31.956	.744	100.00	32
33	French	Yuba City, Sutter Co.	R. C Kells	Sept. 27, 1892	23.0	20.0	94.8	5.2	3.6	1.6	87.2	12.8	25.00	.26	21.79	20.65	.237	.194	.920	.020	.900	1.481	.567	.523	.751	71.17	28.263	.567	100.00	33
	Central California.																													
1	Prune d'Agen*	Mt. View, Santa Clara Co	S. F. Leib	Sept. 28, 1891	23.5	20.4	94.5	5.5	.....	.....	72.6	27.4	25.60	.23	18 52	17.50	.178	.148	.785	.....	.....	1.112	.813	.600	.660	75.96	23.43	.610	100.00	1
2	Prune d'Agen*	Niles, Alameda Co.	Wm. Mortimer	Aug. 28, 1891	22.9	20.8	94.9	5.1	.....	.....	81.2	18.8	20.50	.24	18.80	16.60	.145	.142	.841	.....	.....	.906	.395	.387	.519	79.85	19.905	.395	100.00	2
3	French*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	20 8	23.0	94.24	5.76	.....	.....	86.8	13.2	21.73	.28	18.87	17.64	.168	.124	.766	.....	.....	1.050	.442	.434	.582	77.00	22.55	.440	100.00	3
34	French (Unirrigated)	Campbell, Santa Clara Co.	Campbell Fruit-Growers' Union.	Sept. 1, 1892	30.0	16.0	93.8	6.2	4.3	1.9	80.9	19.1	25.38	.31	20.53	19.24	.218	.180	.655	.100	.555	1.362	.606	.598	.465	65.00	34.394	.606	100.00	34
35	French (Winter Irrigated)	Campbell, Santa Clara Co.	Campbell Fruit-Growers' Union.	Sept. 1, 1892	35.0	13.0	95.2	4.8	.....	.....	85.7	14.3	23.60	.24	20.83	19.98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35
36	French (Irrigated in June)	Campbell, Santa Clara Co.	Campbell Fruit-Growers' Union	Sept. 21, 1892	24.4	19.0	93.9	6.1	.....	.....	82.6	17.4	24.39	.36	20.13	18.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
4	Wangenheim*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	19.5	24.6	95.0	5.0	.....	.....	60.9	31.0	13.45	.52	9.26	8.80	.140	.109	.588	.....	.....	.870	.376	.365	.629	79.74	19.88	.380	100.00	4
5	Robe de Sergent*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	20.0	24.0	92.5	7.5	.....	.....	83.8	16.2	14.00	.48	11.78	9.89	.134	.083	.753	.....	.....	.837	.353	.347	.527	82.50	17.14	.360	100.00	5
37	Robe de Sergent*	San Jose, Santa Clara Co.	John Rock	Aug. 25, 1892	27.7	16.3	94.1	5.9	3.7	2.2	86.2	13.8	19.38	.41	16.71	15.74	.130	.113	.485	0.00	.485	.822	.450	.440	.555	80.00	19.55	.450	100.00	37
6	Fellenberg*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	26.0	17.5	94.1	5.9	.....	.....	76.4	23.6	12.05	.59	9.20	8.67	.139	.117	.499	.....	.....	.879	.350	.344	.434	85.69	13.96	.350	100.00	6
38	Fellenberg	San Jose, Santa Clara Co.	John Rock	Aug. 25, 1892	26.0	17.5	94 1	5.9	3.4	2.5	77.6	22.4	14.66	.61	11.13	10.71	.140	.113	.500	0.07	.430	.875	.458	.440	.980	80.00	19.562	.458	100.00	38
7	Hungarian*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	80.5	6.0	96.3	3.7	.....	.....	70.0	30.0	14.04	.95	11.20	10.72	.122	.114	.326	.....	.....	.732	.392	.385	.416	85.50	14.11	.39	100.00	7
8	Bulgarian*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	25.6	18.8	93.8	6.2	.....	.....	64.0	36.0	13.81	.50	8.37	7.92	.121	.118	.514	.....	.....	.766	.410	.403	.491	82.72	16.87	.41	100.00	8
39	Bulgarian	San Jose, Santa Clara Co.	John Rock	Sept. 30, 1892	17.6	26.5	90.8	9.2	.....	.....	61.1	38.9	25.00	.....	15 30	13 92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39
9	German*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	25.5	18.9	95.3	4.7	.....	.....	71.5	28.5	12.80	.53	9.05	8.43	.168	.150	.512	.....	.....	1.050	.370	.367	.437	83.00	18.63	.37	100.00	9
10	Datte d'Hongrie*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	21.6	22.2	94.0	6.0	.....	.....	81.7	18.3	16.50	.38	13.36	12.44	.133	.104	.560	.....	.....	.842	.330	.320	.405	81.40	18.27	.33	100.00	10
12	St. Catherine*	San Jose, Santa Clara Co.	John Rock	Sept. 8, 1891	18.5	26.0	94.8	5.2	.....	.....	69.4	30.6	22.00	.28	15.21	14.34	.185	.150	.866	.....	.....	1.156	.440	.431	.526	78.78	20.78	.44	100.00	12
	Southern California.																													
40	French ("large")	Ventura, Ventura Co.	J. W. Anderson	Sept. 5, 1892	22.0	21.0	94.3	5.7	4.0	1.7	82.9	17.1	24.39	.29	20.20	19.00	.161	.133	.588	.098	.490	1.006	.508	.500	.630	73.00	26.492	.508	100.00	40
41	French ("small")	Ventura, Ventura Co.	J. W. Anderson	Sept. 5, 1892	16.0	28.1	93.8	6.2	.....	.....	84.0	16.0	22.97	.30	19.29	18.10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41
42	French	Pomona, Los Angeles Co.	P. M. Doyle	Sept. 8, 1892	26.5	17.0	94.9	5.1	3.7	1.4	85 9	14 1	17.68	.40	15.20	14.36	.154	.127	.700	.060	.640	.982	.450	.430	.85	80.00	19.55	.450	100.00	42
43	Same as 42, after keeping three weeks	Pomona, Los Angeles Co.	P. M. Doyle	Sept. 29, 1892	19.5	22.6	93.5	7.5	.....	.....	83.0	17.0	33.10	.50	27.29	25.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
44	French	Chino, San Bernardino Co.	J. W. Lawson	Sept. 20, 1892	21.0	21.5	93.3	6 7	4.3	2.4	83.2	17.8	25.00	.33	20.53	19.18	.215	.194	.67	.02	.55	1.344	.721	.705	.610	71.31	27.969	.721	100.00	44
49	**Averages—French Prunes (13)**				23.6	20 4	94.2	5.8	4.2	1.7	83.1	16.9	23 69	.31	19 70	18.53	.182	.151	.710	.049	.661	1.137	.578	.565	.640	72.82	26.602	.578	100 00	49
50	**Averages—All Prunes (23)**				25.6	20 2	94.2	5.8	.....	.....	78.8	21.2	20 00	.40	16.11	15.35	.162	.134	.635	.....	.....	1.012	.486	.474	.590	77.38	22.134	.486	100.00	50
	PLUMS.																													
45	Coe's Golden Drop	Auburn, Placer Co.	Young Bros.	Oct. 7, 1892	63.5	6.6	96.6	3.4	.....	.....	72.7	27.3	18.12	.20	13.16	12.68	.213	.192	.549	.....	.....	1.321	.636	.629	.803	72.31	27.054	.636	100.00	45
46	Coe's Golden Drop	Marysville, Yuba Co.	Dr. S. Jewett	Aug. 30, 1892	51.0	9.0	94.9	5.1	.....	.....	74.9	25.1	19.60	.26	14.90	14.10	.191	.170	.681	.....	.....	1.194	.466	.454	.554	80.00	19.534	.466	100.00	46
47	Yellow Egg	Marysville, Yuba Co.	Dr. S. Jewett	Aug. 30, 1892	51.8	8 9	93.9	6.1	.....	.....	78.4	21.6	16.20	1.00	12.70	11.90	.141	.117	.549	.....	.....	.884	.503	.490	.504	80.00	19.497	.503	100.00	47
51	**Averages of Plums (3)**				60.4	8 2	95.2	4.8	.....	.....	75.3	24.7	17.97	.48	13.25	12 89	.181	.159	.559	.....	.....	1.133	.535	.524	.620	77.43	22.035	.535	100.00	51
	APRICOTS.																													
	Central California.																													
25	Royal	Concord, Contra Costa Co.	J. T. Sutton	Aug. 1, 1892	75.5	6.0	93.50	6 50	4.9	1.8	91.9	8.1	11.37	.66	10.91	10.20	.263	.231	.737	.103	.634	1.644	.558	.543	.712	84.75	14.962	.558	100.00	25
16	Royal*	Niles, Alameda Co.	Jas. Shinn	Aug. 7, 1891	48 8	9.6	93.40	8.60	.....	.....	90.3	9.7	15.06	.48	13.66	12.30	.258	.217	.840	.....	.....	1.610	.550	.542	.681	85.11	14.34	.550	100.00	16
14	Hemskirk*	Niles, Alameda Co.	Jas. Shinn	Aug. 14, 1891	63.0	7 1	93.98	6.02	.....	.....	85.8	14.2	13.43	.84	11.54	10.70	.199	.168	.784	.....	.....	1.243	.530	.512	.893	84.77	14.70	.530	100.00	14
15	Blenheim*	Niles, Alameda Co.	Jas. Shinn	Aug. 3, 1891	81.0	5.6	94.75	5.25	.....	.....	85.3	14.7	13.43	.....	11 61	11 03	.242	.210	.880	.....	.....	1.513	.555	.540	.350	84.60	14.845	.555	100.00	15
17	Peach*	Niles, Alameda Co.	Jas. Shinn	Aug. 14, 1891	57.5	7.8	93.30	6.70	.....	.....	90.0	10.0	15.72	.58	13.84	12.50	.186	.133	1.050	.....	.....	1.150	.454	.440	.533	85.50	14.05	.450	100.00	17
18	Moorpark*	Niles, Alameda Co.	Jas. Shinn	Aug. 19, 1891	59.2	7.6	94.00	6.00	.....	.....	90.0	10.0	13.58	.64	12.10	11.30	.259	.224	.805	.....	.....	1.619	.494	.484	.612	85.90	13.81	.490	100.00	18
	Southern California.																													
28	Royal	Oleander, Fresno Co.	J. H. Hardiug	June 24, 1892	41.7	10.8	92.90	7.1	4.7	2.4	91.8	9.2	11.60	.53	10.40	9.66	.153	.119	.672	.047	.625	.955	.466	.450	.644	84.34	15.194	.466	100.00	26
27	Royal	Santa Maria, Santa Barbara Co.	L. E. Blochman	Aug. 10, 1892	61.0	7.4	93.70	6.3	4.7	1.6	89.7	10.3	13.10	.67	11.75	10.98	.218	.177	.810	.070	.740	1.362	.370	.340	.630	85.33	14.300	.370	100.00	27
28	Royal	Pomona, Los Angeles Co.	Mrs. J. L. Loomis	July 2, 1892	67.0	6.9	93.60	6.4	5.2	1.2	92.8	7.2	14 40	.90	13.37	12.52	.148	.129	.450	.000	.450	.925	.467	.459	.592	83.76	15.773	.467	100.00	28
29	Hemskirk	Oleander, Fresno Co.	A. Allison	June 25, 1892	67.1	6.8	94.50	5.5	4.2	1.3	93.0	7.0	11.04	.75	10.26	9.70	.164	.129	.710	.060	.650	1.025	.457	.448	.575	86.79	12.753	.457	100.00	29
30	Moorpark	Oleander, Fresno Co.	J. H. Harding	June 24, 1892	66.5	8.9	94.70	5.3	3.6	1.7	89.9	10.1	13.22	.75	11.88	11.25	.144	.118	.530	.040	.490	.897	.503	.498	.572	85.93	13.567	.503	100.00	30
52	**Averages—Apricots (11)**				62.4	7.5	93 85	6.15	4.8	1.6	90.0	10.0	13.31	.68	11 93	11.10	.194	.168	.751	.053	.598	1.260	.491	.477	.668	85.16	14.349	.491	100.00	52
	NECTARINE.																													
48	"The New White"	Yuba City, Sutter Co.	H. P. Stahler	Sept. 1, 1892	102.5	4.4	93.4	6.6	5.72	.94	89.3	10.7	17.17	.62	15.13	14.11	.117	.100	.26	.08	.18	.731	.498	.490	.400	79.00	20.502	.498	100.00	48

† 30 grams are equivalent to 1 ounce. * Analyses published in Bulletin 97.

B.—ANALYSIS OF THE ASH.

Number	Fruit	Place of Production	Percentage of Pure Ash	Composition of Pure Ash: Potash	Soda	Lime	Magnesia	Peroxide of Iron	Br. Oxide of Manganese	Phosphoric Acid	Sulphuric Acid	Silica	Chlorine	Total	Less excess of Oxygen due to Chlorine	Totals
	French Prunes.															
33	Whole Fruit	Yuba City, Sutter Co.	.567	66.92	.92	6.27	5.56	1.70	.36	12.91	2.54	2.67	.43	99.98	.10	99.88
	Flesh		.523	70.72	.84	5.48	5.02	1.30	.18	11.16	2.40	2.44	.46	100.00	.11	99.89
	Pits		.751	24 63	2.13	15.04	11.58	6.13	2.38	29.49	4.13	5.33	.13	99.97	.03	99.94
3	Whole Fruit	San Jose, Santa Clara Co.	.442	65.92	3.18	3.24	6.16	.85	.31	13.19	2.37	4.56	.19	99.97	.05	99.92
	Flesh		.434	69 50	3.07	3.01	5.33	.83	.17	11.58	2.13	4.30	.20	100.10	.05	100.05
	Pits		.582	24.01	4.53	8.04	16.26	1.14	1.90	32.98	5.40	7.88	.22	100.16	.05	100.11
42	Whole Fruit	Pomona, Los Angeles Co.	.450	63.67	3.20	4.48	4.70	1.89	.51	16.14	3 15	1.99	.40	100.13	.10	100.03
	Flesh		.437	87.87	2.99	3.86	4.23	1.06	.33	15.23	2.64	1.48	.37	100.04	.09	99.95
	Pits		.850	20.60	5.33	12.96	9.72	10.41	2.31	25.92	4.63	7.41	.72	100.01	.18	99.83
53	**Average (Whole Fruit)**		.486	63.88	2.65	4.66	5.47	2.72	.39	14.08	2.68	3.07	.34	99.99	.08	99.91

Number	Fruit	Place of Production	Percentage of Pure Ash	Composition of Pure Ash: Potash	Soda	Lime	Magnesia	Peroxide of Iron	Br. Oxide of Manganese	Phosphoric Acid	Sulphuric Acid	Silica	Chlorine	Total	Less excess of Oxygen due to Chlorine	Totals
	Royal Apricots.															
16	Whole Fruit	Niles, Alameda Co.	.550	54.88	10.57	3.52	3.85	1.71	.21	13.86	2.95	7.85	.60	100.00	.15	99.85
	Flesh		.542	58.59	11.20	3.24	3.31	.77	.09	11.20	2.75	8.31	.58	100.04	.14	99.90
	Pits		.681	10.95	3.45	8.75	11.58	12.39	1.85	43.76	5.38	2.58	1.65	100.14	.40	99.74
28	Whole Fruit	Pomona, Los Angeles Co.	.467	63.85	9.95	2.82	3.52	1.66	.54	12.33	2.32	2.62	.30	99.91	.08	99.83
	Flesh		.459	67.00	10.23	2.65	2.89	.97	.39	10.88	2.35	2.27	.28	100.11	.07	100.04
	Pits		.592	23.09	6.45	6.58	11.58	11.22	10.08	2.20	30.96	1.84	7.09	.51	100.00	.12	99.88
54	**Average (Whole Fruit)**		.508	69.36	10.26	3.17	3.68	1.68	.37	13.09	2.63	5.23	.45	99.92	.11	99.81

90 per cent, or *nine-tenths* of the flesh being juice. No. 29, Hemskirk, with 93 per cent, being the juiciest, and No. 15, Blenheim, with 85 per cent, the driest of the series.

The average flesh of the apricots, from this latest showing, is more juicy than that of the prunes, in the ratio of 9 to 8.

Sugar Contents of the Juice, Flesh and Fruit.

The work undertaken for the crops of 1891 and 1892 did not comprehend the determination of the different sugars (dextrose, levulose, cane sugar, etc.), contained in prunes and apricots; the length of time necessary to complete such an investigation for each sample, required us to limit the work to the determination of the most important point—the total sugars.

Prunes. — The ripe, juicy soft-fleshed French prunes from all localities yield the highest sugar percentages, averaging (No. 49), in the juice, 23.69 per cent; the hard-fleshed ripe prunes, represented by Nos. 4, 5, 37, 6, 38, 7, 8, 9, 10 and 12 yield an average of 15.24 per cent sugar—6.24 per cent less, while the average sugar for the average of all prunes (No. 50) is 20.00 per cent, or 3.5 per cent less than that of the French prunes. We note, for the later crop French prunes, a difference of five weeks between the earliest and latest picking, No. 34 picked on Sept. 1, and No. 31 gathered on Oct. 7, yet in the juice these contain nearly identical amounts of sugar, 25.30 per cent, which, when referred to the fresh fruit, shows the *earlier* sample to stand one per cent lower than the later, on account of its being more juicy. The maximum sugar percentage, 26.45, in the juice is seen in No. 32 from Newcastle, picked on Sept. 23—1.45 per cent higher than the earliest and latest French prunes contain. This sample (No. 32) and the others from the various localities gathered in the *third* and *fourth* week of September point to that time as yielding the juiciest and sweetest fruits of their kind. No. 42, from Pomona, shows the least sugar in the juice, 17.68 per cent; this sample as No. 43, after keeping three weeks at a temperature of 60° F., was still only a little shriveled and quite edible, showed that its juice contained 33.10 per cent sugar, or nearly double what the original sample had.

Referring again to the so-called hard-fleshed varities, Robe de Sergent, Fellenberg, Bulgarian, etc., we note some differences in the sugar contents in favor of the later crop samples. No. 37, Robe de Sergent, shows 5.38 per cent more than No. 5; No. 38, Fellenberg, 2.5 per cent more than No. 6; No. 39, Bulgarian, nearly 13 per cent more than No. 8, a difference rather greater than we could probably expect if the samples were more nearly alike in maturity. No. 39, as above stated in its description, was far over-ripe. Some of these results may be explained as due to the evident difference in maturity at the time of the examination for two crops, and, as Mr. Rock writes in the description above, to the general inferiority of the earlier crop ('91).

The *plums*, among themselves show, in the juice, a narrow range in sugar and average about 18.0 per cent of that substance—some 5.5 per cent less than the French prunes, and about 3.5 more than the hard-fleshed varieties.

Apricots.—The fruit from early localities (picked in June) and from later localities (picked in August) show a remarkably close resemblance to each other in regard to sugar contents; the Royal, No. 16, with 15.06 per cent, and Peach, No. 17, with 15.72, the highest in sugar, showing but about 2 per cent more than the general average, 13.31 per cent, for the juice. Taking the general averages of sugar in the juice of prunes and apricots (Nos. 50 and 52), we find that the prunes run over 6 per cent higher; for the whole fruit, 4.2 per cent higher. And as compared with the average French prune (No. 49) the apricots show for the juice some 10 *per cent* less sugar; for the whole fruit, somewhat over 7 per cent less. On the whole fruit, the sugars of the apricots and plums more nearly resemble each other in amount, the average difference being 1.79 per cent in favor of the plums. From the results at hand, it seems that the Nectarine, No. 48, has in the juice nearly 4 per cent more sugar than the apricot, following in this respect very closely the plums.

European reports of these fruits show that

the *juice* of prunes, on the average, contains 6.15 per cent sugar, apricots 4 69 per cent (one case is reported of a small variety of apricots with 16.5 per cent sugar), these figures being about three times less than those herein presented for these fruits as grown in California. There seems thus to be good cause for the preference they have so quickly attained in the market.

By reference to the small table following the relations to each other of the average *sugar* and *acid* contents of some California fruits will readily be seen. For convenience of comparison, the acid is expressed in terms of sulphuric acid (SO_3).

PERCENTAGES OF SUGAR AND ACID.

No. analyses.	FRUITS.	JUICE.	FLESH.	WHOLE FRUIT.
		Acid, per cent.	Sugar, per cent.	
11	Apricots	.68	13.31	11.93	11.10
23	Prunes	.40	20.00	16.11	15 35
13	French prunes	.31	23 69	19.70	18.53
3	Plums	.48	17.97	13.25	12.89
2	Peaches from Shasta and Butte Cos.	.24	17.00	13.40	12.50
1	Nectarine	.62	17.17	15.13	14.11
	Grapes from various localities	.50	24.00	23.00	20.70
80	Oranges from various localities	1.28	10.68	7.12	5.40
2	Figs (White Adriatic) from Kern and Fresno Cos.	.15	23.90	.....	19.20

Acid in the Juice.

Prunes.—The maximum, nearly one per cent, is at once seen in Hungarian, No. 7; the minimum, .23 per cent, in the Prune d'Agen, No. 1; the average, .40 per cent, being almost twice the minimum.

Plums.—Here again we find a very wide difference, even greater than the prunes show; the maximum being 1.00 per cent, the minimum .20 per cent and average .48 per cent.

Apricots.—While the acids differ from .50 per cent to .90 per cent, they do not show as great a diversity as the prunes in this respect but on the average contain like the nectarine about .20 per cent more acid.

In all these fruits it appears that low acids are combined with high sugars. European analyses, which report the acid in terms of Malic, when corrected for Sulphuric, give for prunes .51 per cent, apricots, .70 per cent, and peaches .55 per cent, which do not differ much, except for peaches, from those we report.

Nutritive Values—Nitrogen Contents.

"The flesh-forming ingredients of any article of food being of great importance as regards its proper uses (see Bulletin 93 of the department, relating to oranges and lemons), it is of especial interest to compare in this respect the prune, plum and apricot to other fruits, and the different varieties of prunes, plums and apricots amongst themselves."

The following little table shows how these different fruits we have studied, may be rated in their albuminoid contents, and distribution of the same in the several parts of the fruit, as well as how they compare with European fruits.

AVERAGE PERCENTAGES OF ALBUMINOIDS.

FRUITS.	Number of Analyses.	IN WHOLE FRUIT. TOTAL.	IN THE FRESH FLESH, OR EDIBLE PORTION.	IN FRESH PITS, OR RIND.
			Calculated upon whole fresh fruit.	
ORANGES.				
California	35	1.14	.760	.380
European (Sicilian)	.....	1.78	.....	.....
APRICOTS.				
California	11	1.25	1.088	.162
European	.....	.49	.....	.....
PRUNES.				
California	20	1.012	.837	.175
European	.....	.780	.....	.....
PLUMS.				
California	3	1.13	1.00	.130
European	.....	.40	.....	.....
APPLES & PEARS.				
European	.....	.375	.....	.....
FIGS.				
California (White Adriat'c)	2	1.50	(1.50)	.....
European (Smyrna)	.....	1.42	.....	.....
NECTARINES.	.....	.731	.625	.106

So far then, the fig rates *first* in flesh-forming ingredients, with little choice between the apricots and plums for *second*; and for *third* place, the prunes and oranges run nearly even. Apparently, the Nectarine falls far short of the above fruits in these ingredients, but still ranges considerably higher than apples and pears (from European data only).

The *prunes* of the last crop ('92), have, in in general, yielded a higher average albuminoid contents in the flesh, for we find .84

as against .76 per cent for crop '91. The maximum of the series is seen in Nos. 33 and 44, French prunes, which contain, in the edible portion alone, 1.30 per cent albuminoids, or .36 per cent more than the maximum (.94 per cent) of the crop of '91. At no great distance we see placed No. 34, with 1.12 per cent of these materials; No. 5, Robe de Sergent, still shows the minimum amount, .52 per cent. The French prunes and *plums* have the eame quantity of albuminoids in the flesh, 1.12 per cent. In as far as these flesh-forming ingredients were determined in the hard-fleshed varities, we do not find such differences as in the French prunes in total amounts between the two crops; Nos. 6 and 38, Fallenberg, having respectively .139 and .140 per cents total, and .117 and .113 per cents in the fresh flesh; Nos. 5 and 37, Robe de Sergent yield for totals respectively .134 and .130 per cents, and for fresh flesh .083 and .113 per cents.

Among the *apricots*, the flesh shows wide differences in albuminoids, that of central California fruits yielding the highest figures in most instances, and as compared with prune flesh, much greater variation. The maximum of 1.44 per cent albuminoids, in the flesh, is at once seen in No. 25, Royal, from Contra Costa Co., and the minimum of .737 per cent in No. 30, Moorpark, Fresno Co.; with an average of 1.0 per cent for all.

With this portion of our work we give below a summary of the *food constituents* of some of our *dried* (cured) commercial French prunes, dried apricots, grapes and figs. The results, while inadequate as a basis for general conclusions as to the relative food values of these fruits, nevertheless indicate plainly that the nutrients, notably the sugar and crude protein (albuminoids) differ very widely, *e g.* the sugar in the grape food is 20 per cent more than that of either the apricot or apple, 12 per cent more than that in the French prune, and only 5 per cent less than what is given for the dried fig (white Adriatic). Again, the fig with 4.50 crude protein is 1.60 per cent richer than the grape, apricot, and French prune; however, these latter fruits are all nearly twice as rich as the apple in albuminoids. The maximum ash is in the fig—on the average about 1 per cent more than that in the other fruits.

PERCENTAGE COMPOSITION OF DRIED FRUITS.

CONTENTS. PER CENT.	French Prunes.	Apricots	Grapes...	Figs	Figs	Apples...
	Dried. Edible Portion.		Black Malvasia "Grape Food."*	White Adriatic.....	(European) Smyrna.....	(European)...
Water.....	25.20	32.44	34.83	25.00	20 03	33.00
Ash.....	1 50	1.38	1.16	2.24	2.45	1.40
Albuminoids (Crude Protein).....	2.80	2.90	2.94	4.50	5.70	1.70
Crude Fiber..	.....	.....	3.70	.....	.....	8.30
Nitrogen-free extract	29.77	32.18	2.17	10.11	13.82	21.60
Fat.....	.....	.....	.56	.....	.....	.....
Sugar.....	40.53	29.59	52.50	57.60	58.00	32.00
Free Acid, calculated as Sulphuric (SO_3).....	.40	1.51	.85	.45	.....	2.00
Tannin.....	.....	.....	1.29	.....	.....	.....
Total	100.00	100.00	100.00	100.00	100.00	100.00

*Dried and ground by R. E. Wood, Rutherford, Napa Co., Cal.

Under this head, *nitrogen contents*, it is worth referring again to the large table to call attention to the distribution of the *nitrogen* in the several portions of these fruits. *First*, then, it is readily seen that the flesh holds 85 per cent of all the nitrogen, leaving 15 per cent of it as waste, so far as food values are concerned. *Second*, the distribution of the nitrogen of the pits of the prunes and apricots, to the *kernels* and *shells* appears to rate on the whole about the same, (12 to 1) although we note great variation in this respect in both fruits.

Ash Composition and Nitrogen Contents.

Contrary to statements in our previous publications (Bulletins 88 and 93 of this department), in which, according to European data, the orange stands second (grapes being first) among fruits in the quantity of mineral matter withdrawn from the soil, we find that, weight for weight, the fig has *second* place, the orange *third*, and the prune, apricot and plum *fourth* place; thus more than ever bringing before us the fact that we cannot safely use European results, as heretofore, as a basis of comparison for our fruits.

Upon the basis of the preceding table of this publication, those given in Bulletins 93 and 97 and the yet unpublished work upon our figs, we have prepared the following tabular view of the amounts, in pounds, of vital soil ingredients extracted by the different fruit crops (poor fruit alone) that will have to be replaced by fertilization.

SOIL INGREDIENTS EXTRACTED BY DIFFERENT FRUIT CROPS.

FRUITS.	Total Ash lbs.	Potash lbs.	Phos. acid lbs.	Nitrogen lbs.
GRAPES.				
European.				
In each 1000 lbs.....	8.8	5.00	1.52	1.70
APRICOTS.				
European.				
In each 1000 lbs.....	4.90	.....	.....	.86
Crop of 30,000 lbs.....	147.00	.....	.....	25.80
California.				
In each 1000 lbs.....	4.91	2.90	.64	1.94
Crop of 30,000 lbs.....	147.30	87.00	19.20	59.20
PRUNES.				
European.				
In each 1000 lbs.....	6.3	3.73	.95	1.22
Crop of 30,000 lbs.....	189.00	111.90	28 53	36.60
California.				
In each 1000 lbs.....	4.86	3.10	.68	1.62
Crop of 30,000 lbs.....	145.80	93.00	20.40	48.60
PLUMS.				
In each 1000 lbs.....	5.35	.....	.....	1.81
ORANGES.				
European.				
In each 1000 lbs.....	6.07	2.78	.67	2.69
Crop of 20,000 lbs.....	121.40	55.60	13.40	53.80
California.				
In each 1000 lbs.....	4.32	2.11	.53	1.83
Crop of 20,000 lbs.....	86.40	42.20	10.60	36.60
FIGS.				
European.				
In each 1000 lbs.....	8.00	2.27	.10	2.27
Crop of 15,000 lbs.....	120.00	34.05	1.50	34.05
California. (White Adriatic.)				
In each 1000 lbs.....	7.81	4.69	.86	2.38
Crop of 15,000 lbs.....	117.15	70.45	12.90	35.70

California *prunes* thus appear to draw much less upon all the mineral ingredients which have to be replaced by fertilization than the European; the latter, however, draw much more lightly than the former upon nitrogen. *Apricots* both of California and European growth stand, in total amount, about equal as to mineral ingredients withdrawn; as to nitrogen, the California fruit draws twice as much, showing the only very material difference in the relative proportions of the vital soil ingredients among themselves as far as these two fruits are concerned.

Potash.—In the ashes of prunes and apricots and in the orange, potash is seen to be the leading ingredient; in the prunes and apricots fully three-fifths of the whole ash and in orange at least one-half. In its distribution as between pits and flesh, the greatest difference is shown by the European prune; for apricots we have no foreign data. Although potash constitutes so large a portion of the ash of these fruits its replenishment to the soil will be delayed long beyond the addition of other fertilizing ingredients, because most California soils are naturally so well stocked with it that available potash for the current demand will, in many cases be adequately supplied for many years.

Phosphoric Acid is not so heavily drawn upon in this respect as the European. Its distribution between pits and flesh, also, is not quite so variable as that of potash. Since our soils usually contain a limited supply of phosphoric acid, the prune and apricot as well as the orange orchards will require *phosphatic* fertilizers first, when they are used.

Nitrogen.—Among our pitted fruits the apricot leads in its demand upon the soil in this substance, plums being quite the average of the apricots and prunes and resemble very much the orange in this respect. Thus we find that, for the southern localities especially, the same necessity of early replacement of nitrogen in pitted fruit as for orange orchards and partly for the same reason, viz., that California soils are usually not rich in their natural supply of this substance.

Of the other ash ingredients, it will be seen that *lime* is quite constant, although much less in amount (for prunes) than European standards show. Especially is this difference seen in the comparison of the ash analyses of the flesh and pits. In the orange ash the lime content far exceeds that of either the prune or apricot; accordingly, as our soils generally contain plenty of lime, even for oranges, we would rarely expect to fertilize with a view to its replacement. *Soda* is seen to be much higher here than in European analyses of the ash of the prune; this is probably explained by the fact that California soils, like those of other arid regions, contain much more soda than the European.

GEO. E. COLBY.